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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/875,464	06/05/2001	Ping Tak Peter Tang	42390P11196	6268

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EXAMINER

DO, CHAT C

ART UNIT	PAPER NUMBER
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2124

DATE MAILED: 07/08/2004

4

Please find below and/or attached an Office communication concerning this application or proceeding.

SK

Office Action Summary

Application No.

09/875,464

Applicant(s)

PETER TANG, PING TAK

Examiner

Chat C. Do

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06/05/01; 10/09/01.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-29 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 06/05/01 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 3.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the limitations cited in claim 28 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claim 4 is objected to because of the following informalities:

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Re claim 4, the phrase "Y <= 2" in line 1 should be replaced as "Y is equal or less than 2" for clarification.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 3-11, 14-22, and 25-27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 3, the limitations " $Y * G^k$ " in line 2 and " B_j " in line 3 wherein G and B_j lack antecedence basis. For examination purposes, the examiner considers the limitation G as an integer and larger than Y and the limitation B_j is any break point. Claims 14 and 25 have the same problem.

Re claim 5, it is indefinite by the sub-scripts in limitations " $T_{j,hi}$ " and " $T_{j,lo}$ " in line 2. For examination purposes, the examiner disregards the j sub-scripts in the limitations as " T_{hi} " and " T_{lo} ". Claims 16 and 26 have the same problem.

Thus, claims 4, 6-13, 15-22, and 27 are also rejected for being dependent on the rejected base claims.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-2, 12-13, and 23-24 are rejected under 35 U.S.C. 102(b) as being anticipated by the admitted prior art.

Re claim 1, the admitted prior art discloses in Figure 1 a computer-implemented method for approximating a function of an input argument (page 1 lines 3-8) comprising: selecting one of a plurality of breakpoints (page 1 lines 14-16) such that a reduced argument for the function is less than a predetermined value (page 1 lines 16-17); and evaluating an approximate function of the reduced argument (Figure 1), including accessing a look-up table (108) based on the selected breakpoint (B_j) to obtain a value of a term in the approximate function ($\log_b(1/B_j)$), wherein the look-up table has at least one breakpoint for which the reduced argument can be computed without round off error when the input argument is close to a root of the function (108 with the look-up table).

Re claim 2, the admitted prior art further discloses in Figure 1 the function is $\log_b(x)$ (Figure 1 capture).

Re claim 12, it is an article of manufacture claim of claim 1. Thus, claim 12 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 13, it is an article of manufacture claim of claim 2. Thus, claim 13 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 16, it is an article of manufacture claim of claim 5. Thus, claim 16 is also rejected under the same rationale as cited in the rejection of rejected claim 5.

Re claim 23, it is a computer system claim of claim 1. Thus, claim 23 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 24, it is a computer system claim of claim 2. Thus, claim 24 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 28, the admitted prior art further discloses the processor has a hardware architecture that is deeply pipelined (page 2 lines 15-18) and in which branch mispredictions cause a significant performance penalty (inherently).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 3-5, 9-10, 14-15, 20-21, and 25-26 are rejected under 35 U.S.C. 103(a) as being obvious over the admitted prior art.

Re claim 3, the admitted prior art discloses in Figure 1 representing X in the floating point form $Y \cdot G_k$ where Y is greater than or equal to 1 (page 1 lines 9-11), and wherein the reduced argument is $Z = (Y \cdot B_j - 1)$ where C is a function of $\log_b(e)$ (p_0 in 124 in Figure 1), and evaluating the approximate function (116) includes determining $\log_b(1/B_j)$ using the look-up table and determining $\log_b(X)$ as an arithmetic combination

of at least $k \cdot \log_b(2)$, $\log_b(1/B_j)$, and $\log_b(1+Z/C)$. The admitted prior art does not disclose the reduced argument is multiplied with C as $C \cdot (Y \cdot B_j - 1)$. However, it is known in the art that a same computation can be executed in any order in a process as long as it does not change the result of output as seen in the admitted prior art in Figure 1 wherein the core approximation compute $p_0 R$. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the reduced argument as $C \cdot (Y \cdot B_j - 1)$ as lightly seen in the admitted prior art in Figure 1 because the processes are equivalent.

Re claim 4, the admitted prior art further discloses $Y \leq 2$ and the look-up table is modified such that $B_0 = 1$ and $B_N = \frac{1}{2}$ (page 1 lines 14-16).

Re claim 5, the admitted prior art further discloses $\log_b(1/B_j)$ is given by the look-up table as at least two lower precision values $T_{j,hi}$ and $T_{j,x}$ whose sum equals $\log_b(1/B_j)$ (first line of 108), $\log_b(2)$ is given by at least two lower precision values L_{ju} and L_o whose sum equals $\log_b(2)$ (second line of 108), and Z is given by at least two lower precision values Z_{iu} and Z_{lo} whose sum equals Z (104).

Re claim 9, the admitted prior art further discloses the predetermined value is proportional to $1/(2 \cdot N)$ (page 1 lines 14-16).

Re claim 10, the admitted prior art further discloses $k \cdot L + T$ can be represented without roundoff error for all valid values of k, j (108 by table).

Re claim 14, it is an article of manufacture claim of claim 3. Thus, claim 14 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

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Re claim 15, it is an article of manufacture claim of claim 4. Thus, claim 15 is also rejected under the same rationale as cited in the rejection of rejected claim 4.

Re claim 20, it is an article of manufacture claim of claim 9. Thus, claim 20 is also rejected under the same rationale as cited in the rejection of rejected claim 9.

Re claim 21, it is an article of manufacture claim of claim 10. Thus, claim 21 is also rejected under the same rationale as cited in the rejection of rejected claim 10.

Re claim 25, it is a computer system claim of claim 3. Thus, claim 25 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

Re claim 26, it is a computer system claim of claim 5. Thus, claim 26 is also rejected under the same rationale as cited in the rejection of rejected claim 5.

9. Claim 29 is rejected under 35 U.S.C. 103(a) as being obvious over the admitted prior art in view of Intel Corp. ("Chapter 2: Introduction to the IA-32 Intel Architecture").

Re claim 29, the admitted prior art fails to disclose the processor is one of a plurality of IA-32 series of processors by Intel Corp. However, the Intel Corp. discloses the architecture of IA-32 series of processors. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the processes in the IA-32 processor as seen in Intel Corp.'s invention into the admitted prior art because it would enable to optimize the pipelined and branch instructions (page 2-7 lines 8-10).

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Allowable Subject Matter

10. Claims 6-8, 11, 17-19, 22, and 27 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. U.S. Patent No. 6,480,871 to Phatak discloses an algorithm and VLSI architecture for fast evaluation of trigonometric functions.

b. U.S. Patent No. 5,184,317 to Pickett discloses a method and apparatus for generating mathematical functions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (703) 305-5655. The examiner can normally be reached on M => F from 7:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (703) 305-9662. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2124

June 24, 2004

Kakali Chak
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